

## CLASSIFICATION OF ILLNESSES ATTRIBUTABLE TO FOODS

(A CLASSIFICATION BY SYMPTOMS, INCUBATION PERIODS, AND TYPES OF AGENTS<sup>1, 2)</sup>)

DISEASE	ETIOLOGIC AGENT AND	INCUBATION OR LATENCY	SIGNS & SYMPTOMS	FOODS INVOLVED <sup>3</sup>	SPECIMENS TO COLLECT	FACTORS THAT CONTRIBUTE OUTBREAKS
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### UPPER GASTROINTESTINAL TRACT SIGNS AND SYMPTOMS (NAUSEA, VOMITING) OCCUR FIRST OR PREDOMINATE

#### INCUBATION (LATENCY) PERIOD USUALLY LESS THAN ONE HOUR

##### FUNGAL AGENTS

Gastrointestinal irritating group mushroom poisoning	Possibly resin-like substances in some mushrooms (mushroom species are different than those cited on pp. -- & --.)	30 minutes to 2 hours	Nausea, vomiting, retching, diarrhea, abdominal cramps	Many varieties of wild mushrooms	Vomit	Eating unknown varieties of mushrooms, mistaking toxic mushrooms for edible varieties
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##### CHEMICAL AGENTS

Antimony Poisoning	Antimony in gray enamelware	Few minutes to 1 hour	Vomiting, abdominal pain, diarrhea	High-acid foods and beverages	Vomit, stools, urine	Using/buying antimony-containing utensils, storing high-acid foods in gray enamelware
Cadmium Poisoning	Cadmium in plated utensils	15 to 30 minutes	Nausea, vomiting, abdominal cramps, diarrhea, shock	High-acid foods & beverages, candy love beads or cake decorations	Vomit, stools, urine, blood	Using/buying cadmium-containing utensils, storing high-acid foods in cadmium-containers, ingesting cadmium-containing foods
Copper Poisoning	Copper in pipes and utensils, old dairy white metal	Few minutes to few hours	Metallic taste, nausea, vomiting (green vomit), abdominal pain, diarrhea	High-acid foods and beverages, ice cream (ices) and beverages.	Vomit, gastric washings, urine, blood	Storing high-acid foods in copper utensils or using copper pipes for dispensing high-acid beverages, faulty back-flow prevention valves in vending machines
Fluoride poisoning	Sodium fluoride in insecticides	Few minutes to two hours	Salty or soapy taste, numbness of mouth, vomiting, diarrhea, abdominal pain, pallor, cyanosis dilated pupils, spasms, collapse, shock	Any accidentally contaminated food, particularly dry foods, such as dry milk, flour, baking powder & cake mixes	Vomit, gastric washings	Storing insecticides in same area as foods, mistaking pesticides for powdered foods
Lead poisoning	Lead in earthenware pesticides, putty, plaster, cans with lead solder seams	30 minutes or longer	Mouth and abdominal pain, milky vomit, black or bloody stools, foul breath, shock blue gum line	Beverages stored in lead containing vessels, any accidentally contaminated food	Washings, stools, blood, urine	Storing high-acid foods in lead-containing vessels, storing pesticides in same area as food, imported canned high-acid foods with faulty seams
Tin poisoning	Tin in tinned cans	30 minutes to two hours	Bloating, nausea, vomiting, abdominal cramps, diarrhea, headache	High-acid foods and beverages	Vomit, stools, urine, blood	Using uncoated tin containers for storing acidic foods. Very high tin concentrations are required to cause illness.
Zinc poisoning	Zinc in galvanized containers	Few minutes to few hours	Mouth and abdominal pain, nausea, vomiting, dizziness	High-acid foods and beverages	Vomit, gastric washings, urine, blood, stools	storing high-acid foods in galvanized cans

#### INCUBATION (LATENCY) PERIOD 1 TO 6 HOURS

##### BACTERIAL AGENTS

Bacillus cereus Gastroenteritis (emetic form, mimics staphylococcal intoxication)	Exotoxin of B. cereus organism in soil (strains differ from diarrheal form)	0.5 to 5 hours	Nausea, vomiting, occasionally diarrhea	Boiled or fried rice, pasta, cooked corn-meal dishes, porridge	Vomit, stool	Storing cooked foods at room temperature, storing cooked foods in large containers in refrigerators, preparing foods several hours before serving
Staphylococcal intoxication	Exo-enterotoxins A, B, C, D & E of Staphylococcus aureus, staphylococci from skin, nose & lesions of infected humans and animals and from udders of cows	1 to 8 hours, mean 2 to 4 hours	Nausea, vomiting, retching, abdominal pain, diarrhea, prostration	Lower water activity foods (aw), e.g. cheese, whipped butter, ham, meat & poultry products, cream filled pastry, food mixtures, leftovers, dry milk	Vomit, stools, rectal swabs, carriers nasal swabs, swabs of lesions, anal swab	Inadequate refrigeration, workers touching cooked food, preparing food several hours before serving, workers with infections containing pus, holding foods at warm (bacterial incubating) temperatures, fermentation of abnormally low-acid foods

**CHEMICAL AGENTS**

Nitrite poisoning <sup>4</sup>	Nitrites or nitrates used as meat curing compounds or ground water from shallow wells	1 to 2 hours	Nausea, vomiting, cyanosis, headache, dizziness, weakness, loss of consciousness, chocolate brown colored blood <sup>4</sup>	Cured meats, any accidentally contaminated food exposed to excessive nitrification	Blood	Using excessive amounts of nitrites or nitrates in foods for curing or for covering up spoilage, mistaking nitrites for common salt and other condiments, improper refrigeration of fresh foods.
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**TOXIC ANIMALS**

Diarrhetic shellfish poisoning (DSP)	Okadaic acid and other toxins produced by dinoflagellates, <i>Dinophysis acuminata</i> and other species	0.5 to 12 hours commonly < 3 hrs	Diarrhea, nausea, vomiting, abdominal cramps, chills, fever, headache	Mussels, clams, scallops	Gastric washings	Harvesting shellfish from waters with high concentration of <i>Dinophysis</i>
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**INCUBATION (LATENCY) PERIOD USUALLY 7 TO 12 HOURS****FUNGAL AGENTS**

Cyclopeptide and Gyromitrin groups of mushroom poisoning	Cyclopeptides and Gyromitrin in some mushrooms	6 to 24 hours average 6 - 15 h	Abdominal pain, feeling of fullness, vomiting, protracted diarrhea, loss of strength, thirst, muscle cramps, feeble rapid pulse, collapse, jaundice, drowsiness, dilated pupils, coma, death	<i>Amanita phalloides</i> , <i>A. verna</i> , <i>Galerina antumnalis</i> , <i>Gyromitra esculenta</i> (false morels) and similar species of mushrooms	Urine, blood, vomitus	Eating certain species of <i>Amanita</i> , <i>Galerina</i> , and <i>Gyromitra</i> mushrooms, eating unknown varieties of mushrooms, mistaking toxic mushrooms for edible varieties
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**BURNING MOUTH, SORE THROAT AND RESPIRATORY SIGNS AND SYMPTOMS OCCUR****INCUBATION (LATENCY) PERIOD LESS THAN 1 HOUR****CHEMICAL AGENTS**

Calcium chloride Poisoning	Calcium chloride freezing mixture for Frozen dessert bars	Few minutes	Burning lips, mouth, throat, vomiting	Frozen dessert bar	Vomit	Splashing of freezing mixture onto popsicles while freezing; cracks in molds allowing CaCl <sub>2</sub> to penetrate popsicle syrup
Sodium hydroxide poisoning	Sodium hydroxide in bottle washing compounds, detergents, drain cleaners or hair straighteners	Few minutes	Burning of lips, mouth, and throat; vomiting, diarrhea, abdominal pain	Bottled beverages	Vomit	Inadequate rinsing of bottles cleaned with caustic

**INCUBATION (LATENCY) PERIOD 12 TO 72 HOURS****BACTERIAL AGENTS**

Beta-hemolytic streptococcal infections	<i>Streptococcus pyogenes</i> from throat and lesions of infected humans	1 to 3 days	Sore throat, fever, nausea, vomiting, rhinorrhea, sometimes a rash	Raw milk, foods containing eggs	Throat swabs, vomitus	Workers touching cooked foods, workers with infections containing pus, inadequate refrigeration, inadequate cooking or reheating, preparing foods several hours before serving
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**LOWER GASTROINTESTINAL TRACT SIGNS AND SYMPTOMS (ABDOMINAL CRAMPS, DIARRHEA) OCCUR FIRST OR PREDOMINATE****INCUBATION (LATENCY) PERIOD USUALLY 7 TO 12 HOURS****BACTERIAL AGENTS**

<i>Bacillus cereus</i> enteritis (diarrheal form, mimics <i>C. perfringens</i> )	Enterotoxin of <i>B. cereus</i> , soil organism (strain differs from emetic form)	6 to 16 hours	Nausea, abdominal pain, diarrhea, some reports of vomiting	Cereal products, custards, sauces, starchy foods, e.g. pasta, potatoes, and meatloaf	Stools, vomitus	Inadequate refrigeration, holding of foods at warm (bacterial incubation) temperatures, preparing foods several hours before serving, inadequate reheating of leftovers
<i>Clostridium perfringens</i> gastroenteritis	Endo-enterotoxin formed during sporulation of <i>C. perfringens</i> in intestines, organism in feces of infected humans, other animals, and in soil	8 to 22 hours, mean 10 hours	Abdominal pain, diarrhea	Cooked meat, poultry, gravy, sauces and soups	Stools	Inadequate refrigeration, holding foods at warm (bacterial incubation) temperatures, preparing foods several hours before serving, inadequate reheating of leftovers

## INCUBATION (LATENCY) PERIOD USUALLY 12 TO 72 HOURS BACTERIAL AGENTS

Aeromonas diarrhea	Aeromonas hydrophila	1 to 2 days	Water diarrhea, abdominal pain, nausea, chills, headache	Fish, shellfish, snails, water	Stools	Contamination of foods by sea or surface water
Campylobacteriosis	Campylobacter jejuni	2 to 7 days, mean 3 to 5 days	Diarrhea, (often bloody), severe abdominal pain, fever, anorexia, malaise, headache, vomiting	Raw milk, raw clams and shellfish, water poultry and meat	Stools, rectal swab, blood	Drinking raw milk, eating raw or undercooked shellfish, inadequate cooking or pasteurization
Cholera	Endemic in temperate U.S. coastal sea water. V.cholerae serogroup O1 classical and El Tor biotypes; serogroup O139	1 to 5 days, usually 2 - 3 days	Profuse, watery diarrhea (rice-water stools), vomiting abdominal pain, dehydration, thirst, collapse, reduced skin turgor, wrinkled fingers, sunken eyes, acidosis	Raw fish & shellfish foods washed or prepared with contaminated water	Stools, rectal swabs	Obtaining fish & shellfish from sewage contaminated waters in endemic areas, poor personal hygiene, infected workers touching foods, inadequate cooking, using contaminated water to wash or freshen foods, inadequate sewage disposal, using night soil as fertilizer
Cholera-like vibrio gastroenteritis	Non O1/O139 V. cholerae, & related species, eg, V. mimicus, V. fluvialis, V. holisae	2 to 3 days	Watery diarrhea (varies from loose stools to cholera-like diarrhea)	Raw shellfish, raw fish	Stools, rectal swabs	Eating raw shellfish or raw fish, inadequate cooking, cross contamination
Pathogenic Escherichia coli Diarrhea (THREE FORMS):						
Enterotoxigenic E. coli (ETEC) Gastroenteritis	Enterotoxigenic strains E. coli	10 to 72 hours, usually 24 to 72 hrs	Watery diarrhea, abdominal cramps, nausea, malaise, low grade fever	Water, semi-soft cheeses, foods requiring no further heating	Stools, rectal swab	Infected workers touching foods, inadequate refrigeration, inadequate cleaning and disinfection of equipment
Enterohemorrhagic E. coli (EHEC) Gastroenteritis	O157:H7 E. coli Verotoxins	3 to 9 days, mean 4 days	Bloody diarrhea, severe abdominal cramping, complications- Hemolytic Uremic Syndrome (HUS), kidney failure	Raw ground beef, raw milk, cheese	Stools, rectal swabs	Infected workers touching foods, inadequate refrigeration, inadequate cooking, inadequate cleaning and disinfection of equipment
Enteroinvasive E. coli (EIEC) Gastroenteritis	Enteroinvasive strains of E. coli	10 to 72 hours	Severe abdominal cramps, watery diarrhea, vomiting malaise, complications – HUS, kidney failure	Raw milk, raw ground beef, cheese	Stools, rectal swabs	Infected workers touching foods, inadequate refrigeration, inadequate cooking, inadequate cleaning and disinfection of equipment
Salmonellosis	Various serotypes of Salmonella from feces of infected humans and other animals	6 to 72 hours, mean 18 to 36 hours	Abdominal pain, diarrhea, chills, fever, nausea, vomiting, malaise	Poultry, meat and their products, egg products, other foods contaminated by salmonellae	Stools, rectal swabs	Inadequate refrigeration, holding foods at warm (bacterial incubation) temperatures, inadequate cooking and reheating, preparing foods several hours before serving, cross contamination, inadequate cleaning of equipment, infected workers touching cooked foods, obtaining foods from contaminated sources
Shigellosis	Shigella flexneri, S. dysenteriae, S. sonnei, & S. boydii from feces of infected humans	24 to 72 hours	Abdominal pain, diarrhea, bloody & mucoid stools, fever	Any contaminated foods, frequently salads, water	Stools & rectal swab	Infected workers touching foods, inadequate refrigeration, inadequate cooking and reheating
Vibrio parahaemolyticus Gastroenteritis	V. parahaemolyticus from sea water or seafoods	2 to 48 hours, mean 12 hours	Abdominal pain, diarrhea, nausea, vomiting, fever, chills, headache	Raw seafoods, shellfish	Stools, rectal swabs	Inadequate cooking, inadequate refrigeration, cross contamination, inadequate cleaning of equipment, using seawater in food preparation
Yersiniosis	Yersinia enterocolitica, Y. pseudotuberculosis	24 to 36 hours	Severe abdominal pain, fever, headache malaise, sore throat may mimic appendicitis	Milk, tofu, water, pork	Stools, blood	Inadequate cooking, contamination after pasteurization, contamination of foods by water, rodents, other animals

### VIRAL AGENTS

Astrovirus gastroenteritis	Astroviruses from human feces	1 to 2 days	Diarrhea, sometimes accompanied by one or more enteric signs or symptoms	Ready-to-eat foods	Stools, acute and convalescent blood	Failure to wash hands after defecation, infected person touching ready-to-eat foods, inadequate cooking or reheating
Acute viral Gastroenteritis (Small round structured virus)	Norwalk-like viruses, Caliciviruses	1 to 3 days (Norwalk-like virus mean 36 hours)	Nausea, vomiting, abdominal pain, diarrhea, low grade fever, chills, malaise, anorexia, headache	Clams, oysters, cockles, green salad, pastry, frostings, ice, cut fruit salads	Stools, acute and convalescent blood sera	Polluted shellfish growing waters, poor personal hygiene, infected persons touching prepared foods, foods not requiring further cooking, contaminated waters

### PARASITIC AGENTS

Amebic Dysentery (Amebiasis)	Entamoeba histolytica from feces of infected humans	5 days to several months; mean 3 to 4 weeks	Abdominal pain, constipation or diarrhea	Raw vegetables and fruit	Stools	Poor personal hygiene, infected workers touching food, inadequate cooking
Anisakiasis	Anisakis simplex Pseudoterranova decipiens	4 to 6 hours	Stomach pain, nausea, vomiting, abdominal pain, diarrhea, fever	Rock fish, herring, cod, squid	Stools	Ingestion of raw fish, inadequate cooking
Beef tapeworm infection (Taeniasis)	Taenia saginata from flesh of infected cattle	3 to 6 months	Vague discomfort, hunger pain, loss of weight, abdominal pain	Raw or insufficiently cooked beef	Stools	Lack of meat inspection, inadequate cooking, inadequate sewage disposal, sewage contaminated pastures
Cryptosporidiosis	Cryptosporidium parvum	1 – 12 days, usually 7 days	Profuse watery diarrhea, abdominal pain, anorexia, low grade fever, vomiting	Apple cider, water	Stools, intestinal biopsy	Inadequate sewage or animal waste disposal, contamination by animal manure, contaminated water, inadequate filtration of water
Cyclosporiasis	Cyclospora cayetanensis	1 – 11 days, typically 7 days	Prolonged watery diarrhea, weight loss, fatigue, nausea, anorexia, abdominal cramps	Raspberries, lettuce, basil, water	Stools	Sewage contaminated irrigation or spraying water suspected; washing fruits with contaminated water; possibly handling foods that are not subsequently heated
Fish tapeworm infection (Diphyllobothriasis)	Diphyllobothrium latum from flesh of infected fish	5 to 6 weeks	Vague gastrointestinal discomfort anemia may occur	Raw or insufficiently cooked fresh water fish	Stools	Inadequate cooking, inadequate sewage disposal, sewage contaminated lakes
Giardiasis	Giardia lamblia from feces of humans	1 to 6 weeks	Abdominal pain, mucoid diarrhea, fatty stools	Raw vegetables and fruits, water	Stools	Poor personal hygiene, infected workers touching foods, inadequate sewage disposal
Pork tapeworm infection (Taeniasis)	Taenia solium from flesh of infected swine	3 to 6 months	Vague discomfort, hunger pains, loss of weight	Raw or insufficiently cooked pork	Stools	Lack of meat inspection, inadequate cooking, inadequate sewage disposal, sewage contaminated pastures

### NEUROLOGICAL SIGNS & SYMPTOMS (VISUAL DISTURBANCES, TINGLING, PARALYSIS) OCCUR

#### INCUBATION (LATENCY) PERIOD USUALLY LESS THAN 1 HOUR FUNGAL AGENTS

Ibotenic acid group of mushroom poisoning	Ibotenic acid and muscinol in some mushrooms	0.5 to 2 hours	Drowsiness and dizziness, state of intoxication, confusion, muscular spasms, delirium, visual disturbances	Amanita muscaria, A. pantherina and related species of mushrooms	Vomit	Eating Amanita muscaria and related species of mushrooms, eating unknown varieties of mushrooms, mistaking toxic mushrooms for edible varieties
Muscarine group of mushroom poisoning	Muscarine in some mushrooms	15 minutes to 2 hours	Excessive salivation, perspiration, tearing, reduced blood pressure, irregular pulse, pupils constricted, blurred vision, asthmatic breathing	Clitocybe dealbata, C. rivulosa, and many other species of Inocybe and Boletus mushrooms	Vomit	Eating muscarine group of mushrooms, eating unknown varieties of mushrooms, mistaking toxic mushrooms for edible varieties
Organophosphorous poisoning	Organic phosphorous insecticides such as Parathion, TEPP, Diazinon, Malathion	Few minutes to few hours	Nausea, vomiting, abdominal cramps, diarrhea, headache, nervousness, blurred vision, chest pain, cyanosis, confusion, twitching, convulsions	Any accidentally contaminated food	Blood, urine, fat biopsy	Spraying foods just before harvesting, storing insecticides in same area as foods, mistaking pesticides for powdered foods

## TOXIC ANIMALS

Paralytic shellfish Poisoning (PSP)	Saxitoxin and similar toxins from plankton Alexandrium species which are consumed by shellfish	Few minutes to 30 minutes on average, may take up to 2 hrs	Tingling, burning, numbness around lips and finger tips, giddiness, incoherent speech, respiratory paralysis, sometimes fatal	Bivalve molluscan shellfish, e.g., clams mussels, viscera of crabs and lobsters	N/A	Harvesting shellfish from waters with a high concentration of Alexandrium
Tetradon poisoning Aka Fugu (puffer Fish) poisoning	Tetrodotoxin from intestines and gonads of puffer type fish	10 minutes to 3 hrs	Tingling sensation of fingers & toes, dizziness, pallor, numbness of mouth and extremities, gastrointestinal symptoms hemorrhage and desquamation of skin, eyes fixed, twitching, paralysis, cyanosis sometimes fatal	Puffer-type fish	N/A	Eating puffer-type fish, failure to effectively remove intestines and gonads from puffer-type fish if they are to be eaten
Neurotoxic shellfish Poisoning (NSP)	Brevetoxins from Gymnodinium species	few minutes to few hours	Paresthesia, reversal of hot and cold temperature sensations, nausea, vomiting, diarrhea	Shellfish (mussels, clams) from S.E. coastal waters	Gastric washings	Harvesting shellfish from waters with high concentration of Gymnodinium species of dinoflagellates
Amnesic Shellfish Poisoning (ASP) or Domoic Acid	Domoic acid from diatoms (Toxin is heat stable)	30 min. to 24 hrs for gastrointestinal symptoms, neurological symptoms within 48 hrs	Initially nausea, vomiting, abdominal pain, diarrhea, neurological signs include: confusion, memory loss, disorientation, seizure, coma, death may occur	Shellfish (mussels, clams), finfish (anchovies), viscera of crabs and lobsters	N.A.	Harvesting shellfish, crabs and finfish from waters which experience plankton blooms releasing domoic acid in the harvesting area
Diarrhetic shellfish Poisoning (DSP)	LISTED PREVIOUSLY					THIS IS NOT A NEUROLOGICAL ILLNESS, BUT IS INCLUDED HERE FOR EASE OF REFERENCE WITH <u>ALL SHELLFISH</u> POISONINGS.

## PLANT TOXICANTS

Jimson weed	Tropane alkaloids in Jimson weed	Less than 1 hour	Abnormal thirst, photophobia, distorted sight, difficulty in speaking, flushing, delirium, coma, rapid heart beat	Any part of a plant, tomatoes grafted to Jimson weed stock	Urine	Eating any part of Jimson weed or eating tomatoes from tomato plant grafted to Jimson weed stock
Water hemlock Poisoning	Resin and cicutoxin in hemlock root	15 to 60 minutes	Excessive salivation, nausea, vomiting, Stomach pain, frothing at mouth, irregular breathing, convulsions, respiratory paralysis	Root of water hemlock Cicuta virosa and C. maculata	Urine	Eating water hemlock, mistaking water hemlock root for wild parsnip, sweet potato or carrot

INCUBATION (LATENCY) PERIOD 1-6 HOURS  
CHEMICAL AGENTS

Chlorinated hydrocarbon poisoning	Chlorinated hydrocarbon insecticides such as aldrin, chlordane, ddt, endrin, lindane, & toxaphene	30 minutes to 6 hrs	Nausea, vomiting, paresthesia, dizziness muscular weakness, anorexia, weight loss, confusion	Any accidentally contaminated food	Blood, urine, stools gastric washings	Storing insecticides in same area as food, mistaking insecticides for powdered food
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## TOXIC ANIMALS

Ciguatera Poisoning	Ciguatera toxin in intestines, roe, gonads & flesh of tropical marine fish	3 to 5 hours, sometimes longer	Tingling & numbness about mouth, metallic taste, dry mouth, gastrointestinal symptoms, watery stools, muscular pain, dizziness, dilated eyes, blurred vision, prostration, paralysis, reversal of hot and cold temperature sensations sometimes fatal	Numerous species of tropical fish		Eating liver, intestines, roe, gonads, or flesh of barracuda, large jacks & amberjacks, grouper and other species of tropical reef fish; usually large reef fish are more commonly toxic
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**INCUBATION (LATENCY) PERIOD USUALLY 12 TO 72 HOURS****BACTERIAL AGENTS**

Botulism	Neurotoxins A, B, E & F of Clostridium botulinum spores found in soil & animal intestines	2 hours to 8 days, mean 18 to 36 hrs	Vertigo, double or blurred vision, dryness of mouth, difficulty in swallowing, speaking and breathing, descending muscular weakness, constipation, pupils dilated or fixed, respiratory paralysis, gastrointestinal symptoms may precede neurological symptoms. frequently fatal	Home canned low acid foods, vacuum packed fish; fermented fish eggs, fish and marine mammals	Blood, stool	Inadequate heat processing of canned foods and smoked fish, uncontrolled fermentation
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**INCUBATION (LATENCY) PERIOD GREATER THAN 72 HOURS****CHEMICAL AGENTS**

Mercury poisoning	Methyl & ethyl mercury compounds from industrial waste and organic mercury in fungicides	1 week or longer	Numbness, weakness of legs, spastic paralysis, impairment of vision, blindness, coma	Grains treated with mercury containing fungicide; pork, fish, & shellfish exposed to mercury compounds	Urine, blood, hair	Streams polluted with mercury compounds, feeding animals grains treated with mercury fungicides, eating mercury treated grains or animals fed such grains
Triorthocresyl Phosphate Poisoning	Triorthocresyl phosphate used as extracts or as substitute cooking oil	5 to 21 days, mean 10 days	Gastrointestinal symptoms, leg pain, ungainly high stepping gait, foot and wrist drop	Cooking oils, extracts and other foods contaminated with triorthocresyl phosphate	N/A	Using compound as food extractant or as cooking or salad oil

**GENERALIZED INFECTION SIGNS AND SYMPTOMS (FEVER, CHILL, MALAISE, ACHES) OCCUR****INCUBATION (LATENCY) PERIOD GREATER THAN 72 HOURS****BACTERIAL AGENTS**

Brucellosis	Brucella abortus, B. melitensis, and B. suis from tissues & milk of infected animals	7 to 21 days	Fever, chills, sweats, weakness, malaise, headache, muscle and joint pain, loss of weight	Raw milk, goat cheese	Blood	Failure to pasteurize milk, livestock infected with brucellae
Typhoid fever	Salmonella Typhi from feces of infected humans	7 to 28 days, mean 14 days	Malaise, headache, fever, cough, nausea, vomiting, constipation, abdominal pain, chills, rose spots, bloody stools	Shellfish, foods contaminated by workers, raw milk, cheese, watercress, water	Stools, rectal swabs blood	Infected workers touching foods, poor personal hygiene, inadequate cooking, inadequate refrigeration, inadequate sewage disposal, obtaining foods from unsafe sources, harvesting shellfish from sewage contaminated areas
Listeriosis	Listeria monocytogenes from soil, manure, silage and environment	3 to 21 days, maybe longer	Low grade fever, flu-like illness, stillbirths, meningitis, encephalitis, sepsis, fatalities occur	Cole slaw, milk, cheese, animal products	Blood, urine, cerebrospinal fluid	Inadequate cooking, failure to properly pasteurize milk, prolonged refrigeration, immunosuppressed, pregnant, aged persons, and neonates are at high risk
Vibrio vulnificus Septicemia	Vibrio vulnificus from sea water	16 hr mean < 24 hr	Malaise, chills, fever, prostration, cutaneous lesions, fatalities occur	Raw shellfish and crabs	Blood	Eating raw shellfish, inadequate cooking, persons with liver damage are at high risk

**VIRAL AGENTS**

Hepatitis A (Infectious hepatitis)	Hepatitis A virus from feces, urine, blood of infected humans and other primates	10 to 50 days, mean 25 days	Fever, malaise, lassitude, anorexia, nausea, abdominal pain, jaundice	Shellfish, any food contaminated by hepatitis viruses, water	Urine, blood	Infected workers touching foods, poor personal hygiene, inadequate cooking, harvesting shellfish from sewage contaminated waters, inadequate sewage disposal
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(Note: Hepatitis E is an emerging viral pathogen. It has similar incubation periods and symptoms as Hepatitis A and can be transmitted in foods.)

**PARASITIC AGENTS**

Angiostrongylosis (eosinophilic meningoen- cephalitis)	Angiostrongylus cantonensis (rat lung worm) from rodent feces and soil	14 to 16 days	Gastroenteritis, headache, stiff neck and back, low-grade fever	Raw crabs, prawns, slugs, shrimp & snails	Blood	Inadequate cooking, ingesting raw food
Toxoplasmosis	Toxoplasma gondii from tissue and flesh of infected animals	10 to 13 days	Fever, headache, myalgia, rash	Raw or insufficiently cooked meat (rare)	Biopsy of lymph nodes, blood	Inadequate cooking of meat of sheep, swine and cattle
Trichinosis	Trichinella spiralis (roundworm) from flesh of infected	4 to 28 days, mean 9 days	Gastroenteritis, fever, edema about eyes, muscular pain, chills,	Pork, bear meat, walrus flesh	Muscle biopsy	Eating raw or inadequately cooked pork or bear meat, inadequate cooking or heat processing, feeding

swine or bear

prostration, labored  
breathinguncooked or inadequately heat  
processed garbage to swine**ALLERGIC TYPE SYMPTOMS (FACIAL FLUSHING, ITCHING) OCCUR****INCUBATION (LATENCY) PERIOD LESS THAN 1 HOUR  
BACTERIAL (AND ANIMAL) AGENTS**

Scombroid Poisoning or Histaminosis	Histamine-like substance produced by proteus sp. or other bacteria from histidine in fish flesh	Few minutes to 1 hr	Headache, dizziness, nausea, vomiting, peppery taste, burning throat, facial swelling and flushing, stomach pain, itching of skin	Tuna, mackerel, Pacific dolphin (known as the mahi on the Pacific coast of the U.S.), jack, anchovy, marlin, swordfish, bluefish, sometimes from ripened cheese	Vomitus	Inadequate refrigeration of scombroid fish and improper curing of cheese
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**CHEMICALS**

Monosodium glutamate (MSG) poisoning	Excessive amounts of monosodium glutamate (MSG)	Few minutes to 1 hr	Burning sensation in back of neck, forearms chest, feeling of tightness, tingling, flushing, dizziness, headache, nausea	Foods seasoned with MSG	N/A	Using excessive amounts of MSG as flavor intensifier.
Nicotinic acid (niacin) poisoning	Sodium nicotinate used as a color preservative	Few minutes to 1 hr	Flushing, sensation of warmth, itching abdominal pain, puffiness of face and knees	Meat or other food in which sodium nicotinate has been added	N/A	Using sodium nicotinate as color preservative
	Dietary supplements of niacin used chronically	A few days to a few months	Impairment of liver function (elevated transaminases), can result in fulminant liver failure	High potency dietary supplements, especially when used in multiples (500mg or more per day)	N/A	Dietary supplements of niacin can cause similar acute symptoms as niacin, but seldom does because of infrequent use at high doses

**INCUBATION (LATENCY) PERIOD 1 TO 6 HOURS  
TOXIC ANIMALS**

Hypervitaminosis A	Vitamin A containing foods or dietary supplements	Acute: 1 to 6 hours	Headache, gastrointestinal symptoms, dizziness, collapse, convulsions, desquamation of skin	Liver & kidney of arctic mammals	Blood	Eating liver & kidney from cold region animals
		Chronic: days to months or years	Chronic use can cause liver disease, including cirrhosis	High potency dietary supplements, especially with chronic use	N/A or Blood?	Chronic usage of dietary supplements containing 25,000 IU vitamin A or more per day

1. Symptoms and incubation periods will vary with the individual and group exposed because of resistance, age, and nutritional status of individuals, number of organism or concentration of poison in ingested foods, amount of food ingested, pathogenicity and virulence of strains of microorganisms or toxicity of chemical involved. Several of the illnesses are manifested by symptoms in more than one category and have an incubation range that overlaps the generalized categories.
2. A more detailed review can be found in:
  - A. Bryan, F.L. 1982, Diseases Transmitted by Foods (A classification and summary), second edition, Centers for Disease Control, Atlanta, GA.
  - B. Rhodehamel, E.J., Editor, 1992, "Foodborne Pathogenic Microorganisms and Natural Toxins", Third Edition, Food and Drug Administration, Washington, D.C.
  - C. Bryan, F.L., Chairman, Committee on Communicable Diseases Affecting Man, 1999, "Procedures to Investigate Foodborne Illness" Fifth edition, International Association of Milk, Food, and Environmental Sanitarians, Inc., Ames, IA
3. Samples of any of the listed foods that have been ingested during the incubation period of the disease should be collected.
4. Carbon monoxide poisoning may simulate some of the diseases listed in this category. Patients who have been in closed care with motors running or have been in rooms with improperly vented heaters are subject to exposure to carbon monoxide.